GANPAT UNIVERSITY

FACULTY OF GANPAT UNIVERSITY INSTITUTE OF TECHNOLOGY

Programme	Diploma Engineering	Branch/Spec.	Mechanical Engineering
Semester	VI	Version	1.0.0.0
Effective from Academic Year	2016-17	Effective for the batch Admitted in	July 2014
Subject code	1ME601	Subject Name	Computer Aided Manufacturing

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

None

Learning Outcome:

After successful completion of the course, student will be able to

- Identify different axes, machine zero, home position, controls and features of CNC machines.
- Select, mount and set cutting tools and tool holders on CNC.
- Prepare part programmes using ISO format for given simple components with and without use of MACRO, CANNED CYCLE and SUBROUTINE using ISO format.
- Interface software application for auto part programming.

Theory syllabus

Unit	Content	Hrs
1	**Fundamentals of CAM** CAM - concept and definition. NC (Numerical Control), CNC (Computerized Numerical Control) and DNC (Direct Numerical Control) - concept, features and differences. Advantages and limitations of CNC. Selection criteria for CNC machines.	5
2	**Constructional features of CNC machines** CNC machines: Types, classification, working and constructional features. Spindle drives and axes drives on CNC machines. Machine structure- Requirements and reasons. Elements of CNC machines - Types, sketch, working and importance of slide ways, re-circulating ball screw, feedback devices (transducers, encoders), automatic tool changer (ATC), automatic pallet changer (APC). CNC axes and motion nomenclature. CNC tooling.	8
3	**CNC Turning & Machining Centers** CNC turning centres: Types, Features, Axes nomenclature, Specification, Work holding devices, Tool holding and changing devices. CNC machining centres: Types, Features, Axes nomenclature, Specification, Work holding devices, Tool holding and changing devices.	7
4	**CNC part programming** Definition and importance of various positions like machine zero, home position, workpiece zero and programme zero. Programming format and structure of part programme. ISO G and M codes for turning and milling-meaning and applications of important codes. Simple part programming for turning using ISO format having straight turning, taper turning (linear interpolation) and convex/concave turning (circular interpolation). Simple part programming for milling using ISO format. Importance, types, applications and format for canned cycles, macro, do loops, subroutine. CNC turning and milling part programming using canned cycles, Do loops and Subroutine. Need and importance of various compensations: Tool length compensation, Pitch error compensation, Tool radius compensation, Tool offset. Simple part	14

	programming using various compensations.	
5	**Recent trends in CAM** Interfacing standards for CAD/CAM - Types and applications. Adaptive control- definition, meaning, block diagram, sources of variability and applications. Flexible Manufacturing System (FMS) - concept, evaluation, main elements and their functions, layout and its importance, applications. Computer Integrated Manufacturing (CIM) - Concept, definition, areas covered, benefits. Robotics- definition, terminology, classification and types, elements and applications. Rapid prototyping - Concept and application	8
Practical content		
Practical, assignments and tutorials are based on above syllabus.		
Text Books		
1	CAD/CAM: Computer Aided Design and Manufacturing, by GrooverMikell P, Zimmered W Emory, Prentice Hall 2011.	
Reference Books		
1	Computer Aided Manufacturing by Rao	
2	CAD/CAM/CIM by P. Radhakrishnan & S.Subramanayan	

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Programme	Diploma Engineering	Branch/Spec.	Mechanical Engineering
Semester	VI	Version	1.0.0.0
Effective from Academic Year	2016-17	Effective for the batch Admitted in	July 2014
Subject code	1ME602	Subject Name	Industrial Engineering

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

None

Learning Outcome:

After successful completion of the course, student will be able to

- Improve productivity using work study and method study techniques.
- Analyze work content and calculate standard time in a given situation.
- Apply Statistical Quality Control tools in a given situation.
- Select material handling equipment.
- Apply Ergonomics for human comfort at work place.
- Appreciate the emerging trends in industrial engineering.

Theory syllabus

Unit	Content	Hrs
1	**Introduction to Industrial Engineering** Definition, objectives and techniques, scope, importance and applications of industrial engineering. Methodology and approach of Industrial engineering. Productivity – concept, definition, importance and ways to enhance it, numeric examples. Introduction to work study and statistical quality control (SQC).	4
2	**Work Study** Work study-Definition, techniques and role to enhance productivity. Importance of human factors in application of work study techniques. Basic procedure of method study. Methods of recording data for method study using standard symbols, process charts and diagrams. Process planning-concept, meaning, importance, functions, procedure and forms used. Principles of motion economy applied in a use of human body, design of work place layout, design of tools and equipment. Principles of micro motion study, Therbligs and SIMO chart. Man and machine chart. Basic procedure of work measurement. Equipment used in time study. Job elements and their types. Methods of measuring time-cumulative and fly back timing. Concept of rating and rating scale. Allowances-types, normal values and applications. Calculation of basic time, standard time and work content. Concept of work sampling/ activity sampling.	14
3	**Quality Assurance** Quality, Quality control (QC), Quality assurance (QA), Statistical quality control (SQC) and reliability. QA tools. Concept of total quality cycle, quality of design, quality of performance, quality of conformity and total quality. Difference between inspection and quality control. Fundamentals of statistics-types of variations, frequency, class boundary and midpoint, frequency distribution, frequency histogram, frequency bar chart and polygon chart. Frequency distribution curve, central tendency, spread or dispersion and range, mode, median	6

	and mean, standard deviation and variance with numeric examples. Concept of probability and normal distribution. Introduction to binomial and Poisson distribution.	
4	**Statistical Quality Control (SQC)** Concept of variability. SQC tools and statistical fundamentals. Concept and differences between variables and attributes. Control charts for variable quality-types, objectives, applications, calculations of control limits and range/mean, methods to plot and interpretations (X bar-R chart) and examples. Control charts for attribute quality-types, objectives, applications, calculations of control limits and range/mean, methods to plot and interpretations (p, np, 100p and c chart) and examples. Process capability, Acceptance sampling.	8
5	**Plant layout and material handling equipments** Plant layout: Definition and concept. Types of plant layout, their applications, advantages and limitations. Role of material handling systems in industries.	4
6	**Recent trends in industrial engineering** International Organization for standardization and its role, ISO standard series and quality managements system. Total Quality Control (TQC) and Total Quality Management (TQM)-philosophical concepts.Concept of six sigma and its applications. Concept and applications of Kaizen. Definition, objectives and applications of ergonomics. Normal and maximum work area. Environmental requirements of work place.	6
Practical content		
Practical, assignments and tutorials are based on above syllabus.		
Text Books		
1	Industrial Engineering by R.R.Mahitcha, AtulPrakasan.	
Reference Books		
1	Industrial Engineering and Industrial Management Pulela	
2	Inspection and Quality Control N.P.C.	
3	An Introduction to Productivity N.P.C.	
4	Handbook of Industrial Engineering by GavrielSalvendy, Institute of Industrial Engineers.	
5	Industrial Engineering by R.C.Patel.	

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Programme	Diploma Engineering	Branch/Spec.	Mechanical Engineering
Semester	VI	Version	1.0.0.0
Effective from Academic Year	2016-17	Effective for the batch Admitted in	July 2014
Subject code	1ME603	Subject Name	Thermal Engineering

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	4	0	1	0	5	Theory	40	60	100
Hours	4	0	2	0	6	Practical	30	20	50

Pre-requisites:

None

Learning Outcome:

After successful completion of the course, student will be able to

- Determine steam properties and dryness fractions.
- Identify the elements and processes of steam condensers and cooling towers.
- Operate air compressors and observe the parameters affecting the performance.
- Analyze performance of IC engines and properties of alternate fuels used for IC engines.
- Analyse the performance of Vapour Compression Refrigeration System and observing the changes in properties of refrigerant during each process on VCRS
- Working of various air-conditioning equipments and aids including ducts and fans
- Calculate heat transfer for given heat transfer system.

Theory syllabus

Unit	Content	Hrs
1	**Two phase system** Concept of two phase system. Formation of steam, its various phases,definition and representati of wet steam, dry steam, saturated steam and superheated steam on PV, T-S and H-S diagram. Concept and determination of dryness fraction and degree of superheat. Concept and determination of latent heat, sensible heat, enthalpy, entropy and specific volume of steam. Use Steam tables and Mollier chart- (Heat Entropy Chart). Throttling process. Methods of measurement of steam quality, Calorimeters-Bucket, Separating,Throttling and Combined calorimeters.	7
2	**Steam condensers and cooling towers** Elements of a steam condensing plant, concept, function and classification of condensers. Jet condensers and surface condensers- constructional sketch, working and differences. Vacuum efficiency and condenser efficiency of condensers. Classification, function and working of cooling towers.	3
3	**Air compressors** Air compressor-concepts, functions, classification and applications. Working of reciprocating air compressor and rotary air compressors. Single stage air compressor and multistage air compressor. Power required and efficiency of reciprocating air compressors-single and two stages. Concept of screw compressors for oil free air.	8

4	**Internal Combustion (I. C.) Engines** Concepts and classification.I.C. engines parts and their functions. Working of two stroke and four stroke cycle Spark Ignition (SI) and Compression Ignition (CI) engines. Valve timing of I.C. engine and its explanation on PV diagram. Various systems of I.C.engines. Carburetion, fuel pump and fuel injectors including Multi Point Fuel Injectors (MPFI).Scavenging and Turbocharger. Performance testing on I.C. engine and its heat balance sheet. Familiarization with IS testing. Concept of octane and cetane numbers. Alternatives fuel-types, CNG, LPG, and Biodiesel).National and International emission norms.	14
5	**Refrigeration and Air-Conditioning** Introduction, working on PV and TS diagrams and applications of Vapour Compression Refrigeration System (VCRS) and Vapour Absorption Refrigeration System (VARS). Working of components of vapour compression refrigeration system. Calculation of Coefficient Of Performance and Refrigeration Effect. Properties and applications of commonly used refrigerants including R22, R134a and R717 (Ammonia).Air conditioning- types and its applications. Psychrometry and various Air conditioning processes on Psychrometric charts. Window/Split air conditioners.	15
6	**Heat transfer** Various modes of heat transfer. Conduction heat transfer- Fourier's law, thermal conductivity, heat transfer through a plain wall, composite wall and cylinder. Convection heat transfer, Newton's law of convection, Free and force convection, coefficient of convection. Radiation heat transfer, Blackbody concept, emissivity, refractivity, absorptivity, Stefan and Boltzmann's law. Thermal conductivity. Need, types, properties and applications of insulating materials in various industries. Difference between hot and cold insulation. Over all heat transfer coefficient. Heat exchanger: introduction, types and applications- Logarithmic Mean Temperature Difference (LMTD).	9
Practical content		
Practical, assignments and tutorials are based on above syllabus.		
Text Books		
1	Thermal Engineering by R.B. Varia, AtulPrakasan.	
Reference Books		
1	Thermal Engineering by P.L.Ballaney	
2	Thermal Engineering by A. S. Sarao	
3	Heat Engines by Pandya and Shah	
4	Refrigeration and Air conditioning by Arora&Domkundwar	
5	I C Engine by Mathur and Sharma	

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Semester	VI	Version	1.0.0.0
Effective from Academic Year	2016-17	Effective for the batch Admitted in	July 2014
Subject code	1ME604	Subject Name	Power Plant Engineering

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

None

Learning Outcome:

After successful completion of the course, student will be able to

- Identify elements and their functions of steam, hydro, diesel, nuclear, wind and solar power plants.
- Operate equipments of different power plants.
- Analyze economics of power plants and list factors affecting the power plants
- Determine performance of power plants based on load variations.

Theory syllabus

Unit	Content	Hrs
1	**Introduction to Power plants** Energy needs of India. Introduction to power plants & their importance, power plants concepts, types and energy conversion in each type. National Grids. Hydro power plant: General arrangement & its operation, classification, advantages and disadvantages, technical data of hydro power plants in Gujarat. Diesel power plant: General arrangement & its operation, classification, advantages and disadvantages, technical data of diesel engine power plants in Gujarat. Nuclear power plant: general arrangement & its operation, classification, basic nuclear physics fundamentals, criteria for selection of installation of nuclear power plant, advantages and disadvantages, technical data of nuclear power plants in Gujarat, safe disposal of nuclear waste.	8
2	**Steam power Plants** Working of Rankine cycle, reheats cycle regenerative cycle, reheat regenerative cycles and plot them on P-v and T-s diagram. Working sketch and working of high pressure boilers: Lamont boiler, Benson boiler, Loeffler boiler, Velox boiler, Schmidt Hartman boiler, Ramsin boiler, Stirling boiler (three steam drum, two mud drum boiler)-sketch and working. Fluidized bed combustion boilers (FBC). Need of water treatment plant for boilers. Schematic diagram of modern thermal power plant. Super heaters and air pre heaters. Fuel handling systems-methods of coal handling like pulverized fuel system, etc. Concept of Electro-Static Precipitators (ESP). Effect of load variation in steam power plant. Area and centralized control system of power plants. Basic elements and requirements of good control system of power plant. Instrumentations used in modern power plants. Concept of Steam temperature control and feed water control systems. Need of record keeping.	20

3	**Gas Turbine Power Plant** Introduction to gas turbine power plant. Concept of Brayton cycle. Arrangement of open and close cycle with constant pressure gas turbine power plant. Components of gas turbine power plant. Essential auxiliaries of gas turbine power plant. Methods to improve the thermal efficiency of a simple open cycle constant pressure gas turbine power plant. Advantages of gas turbine power plant over others.	5
4	**Solar and Wind Power Plants** Wind power plant, Solar power plant, Solar cell and solar panel. Conversion systems for solar energy. Potential of solar and wind energy in India	4
5	**Economic Analysis of Power Plants** Cost of electrical energy. Selection of type of generation. Performance and load deviation of power plants.	5
Practical content		
Practical, assignments and tutorials are based on above syllabus.		
Text Books		
1	Power Plant Engineering by Domkundwar, Dhanpatrai Publications	
Reference Books		
1	Power Plant Engineering by Dr. P C Sharma	
2	A Text Book of Power Plant Engineering by R K Rajput	

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Semester	VI	Version	1.0.0.0
Effective from Academic Year	2016-17	Effective for the batch Admitted in	July 2014
Subject code	1ME605	Subject Name	Major Project

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	0	0	2	0	2	Theory	0	0	0
Hours	0	0	4	0	4	Practical	100	100	200

Pre-requisites:

None

Learning Outcome:

After successful completion of the course, student will be able to

- Plan and identify materials, processes and other resources optimally.
- Develop innovative and creative ideas.
- Develop interpersonal skill and team work.
- Develop sense of environmental responsibility.
- Purchase raw material/standard parts.
- Familiar with fast changes in technology.

Practical content

Sr. No.	Topics	Hrs
1	The major project should be:- a) Innovative in nature b) Feasible using the infrastructure of the Institute. c) To give practice for drawing/drafting. d) Incorporating major manufacturing processes if possible. e) Non repetitive in nature f) To develop the generic as well as Technology related skills. g) Having measurable and analytical end results.	06
2	The typical examples of the Major project could be a) Tooling Equipment –Attachments b) Working model of any mechanism/machine c) Energy conservation Units Non Conventional Energy equipment d) Laboratory demonstration Units e) Measuring and Inspection set ups. f) Sensor based mechanisms g) Servo/stepper motor/sensor based devices h) Control devices/mechanisms i) Robotic applications j) Agriculture/pharmaceutical/textile/printin based production mechanisms /machines k) Working model of bottle/pouch filling machine	10
3	Use internet search, print mediums, expert field consultation, visits to industry/exhibition, etc.	10
4	Major project, selected individually or in group and approved by batch faculty, has to be	12

	undertaken for execution in subject Project-II. Preparation of report includes following. a) Literature survey (Internet, print, visits, etc) b) Details of various feasible projects considered. c) Selection criteria and finalization of minimum two projects. d) Assembly Drawing/Sketch of projects finalized e) Parts/material lists f) Work distribution amongst group students, scheduling and actual occurrence of activities.	

Notes

1. Prepare the report with A4 size paper,30mm left margin,20mm top, bottom and right margins, Arial font of size 14 for titles and size 12 for detail content, single spacing, page number on top right in header. Academic year, short name of the institute in footer. Prepared in MS Word, print on one side of paper.
2. Term work report of student of regular mode should exclude Distance Learning manual, photocopies, pre-printed content, etc. Focus should be on developing the term work as original efforts of students.
3. Term work (hard copy) should also include experience logbook duly certified by workshop instructors (if applicable), Industry/Market/Field personnel (if applicable) and subject teachers.
4. Term work has to be defended (along with term work) by Practical / Oral examination to be conducted by external and internal examiners.

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Programme	Diploma Engineering				Branch/Spec.	Mechanical Engineering			
Semester	VI				Version	1.0.0.0			
Effective from Academic Year	2016-17				Effective for the batch Admitted in	July 2014			
Subject code	1ME606		Subject Name		Fabrication Technology				
Teaching scheme					Examination scheme (Marks)				
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

None

Learning Outcome:

After successful completion of the course, student will be able to

- Interpret the fabrication drawings and plan the fabrication processes requirements and calculate the materials requirements.
- Develop welding documents like WPS, WPQ, SWP and WTP.
- Suggest steps for erection, installation and commissioning of fabricated equipment.
- Follow safety norms during fabrication process.

Theory syllabus

Unit	Content	Hrs
1	**Introduction** Need and scope of fabrication technology in industries. Weldability-concept, meaning, definition and factors affecting it and its importance. Power source-classification, advantages, limitations, features, applications and selection criteria. List of national and international fabrication industries and third party inspection agencies.	4
2	**Drawing Interpretation** Welding location of elements, welding general nomenclature, welding symbols as per IS: 696-1972, welding supplementary symbols, abbreviations used for welding processes and welding position. Interpretation and method to work out bill of material for different types of drawings. Types, sketch, edge preparation and applications of weld - square butt, groove, fillet, plug, Types of joint butt, lap, corner, tee and edge, Types of weld edge preparation. Welding documents - Weld Test Plan (WTP) and Shop Weld Plan (SWP). Introduction to ASME section IX Welding Procedure Specification (WPS) and Welder Performance Qualification (WPQ). Need and application areas of different codes used in fabrication industries remaining ASME sections, ASTM, AWS, IS, BIS, JIS, EN, DIN, TEMA, EJMA.	14
3	**Fabrication Processes and Safety** Equipment/machines used for edge preparation, their working & features. Preheating and inter-pass. Post heating-need, method and applications. Post Weld Heat Treatment (PWHT)-need, methods, applications and selection criteria. Methods of relieving thermal stresses. Arc welding parameters-setting criteria: Voltage, Current, Welding speed, Welding feed, Arc length. Advance welding methods and their applications. Welding automation. Process equipment fabrication procedures. Need, precautions and safety norms during welding and fabrication process.	8

4	**Inspection and Testing** Common weld defects, their causes and remedies. Thermal distortion, Weld quality. Introduction to inspection and testing. Stages of inspection. Types, methods of testing and importance of destructive testing (DT). Types, methods of testing and importance of Non Destructive Testing (NDT). (Liquid penetrate testing, Magnetic Particle Testing, Ultrasonic Testing, Radiography Testing, Eddy Current Testing) Special types of test like Hydro test, Pneumatic test, and Leak test by soap water and helium gas.	8
5	**Surface preparation, Finishing and Coating Methods** Surface preparation methods, sand blasting and ball blasting. Surface finishing methods, brushing and grinding. Surface colour coating by brush, roller and spray applications.	4
6	**Installation, Erection and Commissioning** Erection steps for common fabrication structure. Erection steps for equipment to be fabricated. Erection steps for piping. Installation and commissioning procedures for plant machineries and fabricated equipment.	4
Practical content		
Practical, assignments and tutorials are based on above syllabus.		
Text Books		
1	Welding Technology by O.P. Khanna, DhanpatRai Publications	
Reference Books		
1	Welding Engineering and Technology by R.S. Parmar	
2	Metal cutting science & Production Technology by K.C.Jain& L. N. Agrawal	

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Programme	Diploma Engineering	Branch/Spec.	Mechanical Engineering
Semester	VI	Version	1.0.0.0
Effective from Academic Year	2016-17	Effective for the batch Admitted in	July 2014
Subject code	1ME607	Subject Name	Advance Manufacturing System

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

None

Learning Outcome:

After successful completion of the course, student will be able to

- Explain role of computers and information technology in manufacturing systems.
- Develop an FMS (Flexible Manufacturing System) layout for given simple part family, using group technology concepts to and make proper grouping as per their attributes.
- Recognize use of robotics, programmable logic controllers, microcontrollers and recent advances in the field of manufacturing.

Theory syllabus

Unit	Content	Hrs
1	**Introduction** Evolution of transformation & manufacturing systems. Need of attitude, knowledge & skill required for application of manufacturing systems. Need for system approach. Role of computers and information technology in manufacturing and manufacturing systems. Product life cycle & its importance. Technology life cycle. Scope, importance and challenges in Indian context to manufacture products at international competitive price with better quality& innovation.	4
2	**Group Technology (GT) & Cellular Layout** GT - concept, definition, need, scope, & benefits. Production layout-types, features and applications. GT Layout -concept, need, benefits, comparison with conventional layout with examples. GT- codification systems- types, method of coding and examples. Part features-concept, types and examples. Part family- concept, method to form and approach to form cell using part families. Types and comparison of cell: manual and automatic cell, assembly cell. Steps of cell design and cell layout.	6
3	**Flexible Manufacturing System (FMS)** Flexible Manufacturing System (FMS) –concept, definition and comparison with other manufacturing systems. Major elements of FMS and their functioning. FMS layout - concept, types and applications. Data required developing an FMS layout. Signal flow diagram and line balancing in FMS. FMS layout illustrations.	6
4	**Robotics** Robots-concept, definition, benefits and various areas of application in manufacturing systems. Terminology used in robotics. Robots-types, physical configuration, classification and selection criterion. Axes nomenclature. Types and uses of Manipulators & Grippers. Sensors- types, classifications, working principle and applications of position, force & torque, proximity, vision,	10

	velocity & acceleration sensors. Overview of robot programming methods & languages.	
5	**Programmable Logic Controller (PLC) & Micro-Controllers (MC)** Role of control system in instrumentation. Open and close loop control system, types and block diagram. Servomechanism and regulators with suitable examples. Basic control actions - on-off, proportional, derivative, integral control, proportional derivative (PD), proportional integral (PI), p proportional integral and derivative (PID) control. Basic digital logic gates: symbol, operation, truth-table and examples of AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR gates. PLC: Concept, general constructional features, types of diagrams, working and major applications in manufacturing systems. Use of SCADA (Supervisory Control And Data Acquisition) in PLC design. Microcontrollers: introduction, hardware components, i/o pins, ports; selection of micro controllers & embedded controllers, applications.	10
6	**Recent Trends** Computer Aided Process Planning (CAPP) - concept, types, features, methods and importance. Computer Integrated Manufacturing (CIM): need, block diagram, functional areas covered and their importance. Protocols in CIM- their features, functions and applications. Computer Aided Inspection (CAI) - concept, benefit, types, working and examples. Coordinate Measuring Machine (CMM) - its working and applications. Rapid Prototyping (RP): working principles, methods, applications and limitations, rapid tooling, techniques for rapid prototyping. Artificial intelligence- concept, definition and application areas, neural network: working principles, applications and limitations. Lean manufacturing - concept, sources of waste, benefits and applications. Factory of future (FOF).	6
Practical content		
Practical, assignments and tutorials are based on above syllabus.		
Text Books		
1	Automation, Production and Computer integrated Manufacturing by Mikell P. Groover, PHI publication	
Reference Books		
1	Computer Integrated Design & Manufacturing by Bedworth. Wolfe and Anderson McGraw Hill International Publication.	
2	Introduction to Robotics by Arthur J. Critchlow, McMillan publication	
3	Automation, Production and Computer integrated Manufacturing by Mikell P. Groover, PHI publication	

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Programme	Diploma Engineering	Branch/Spec.	Mechanical Engineering
Semester	VI	Version	1.0.0.0
Effective from Academic Year	2016-17	Effective for the batch Admitted in	July 2014
Subject code	1ME608	Subject Name	Tool Engineering

Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture(DT)		Practical(Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	1	0	4	Theory	40	60	100
Hours	3	0	2	0	5	Practical	30	20	50

Pre-requisites:

None

Learning Outcome:

After successful completion of the course, student will be able to

- Re-sharpen given cutting tool.
- Select proper tool for given manufacturing operation.
- Interpret designation system of cutting tool and tool holder.
- Select locating and clamping devices for given component.
- Select and design jig and fixture for given simple component.
- Classify and explain various press tools and press tools operations.
- Select a die for a given simple component.

Theory syllabus

Unit	Content	Hrs
1	**Introduction** Concept, meaning and definitions of tool, tool design and tool engineering. Tools-types, classification, features & applications. Tool engineering-functions and importance to enhance productivity and quality. Importance of process planning in tool engineering. Economy-concept, meaning, importance and principles in tool engineering. Universal acts & their elements of a manufacturing operation with suitable simple example.	3
2	**Cutting tools and tool holders** Cutting tool materials-types, composition, properties and applications. Carbide inserts-types, ISO-designation and applications. Re-sharpening methods of cutting tools. Tool holders for turning and milling carbide inserts-types, ISO-designation and applications.Tool holding and tool mounting systems for conventional milling and drilling machine tools.	7
3	**Locating and clamping devices** Concept, meaning and definitions of location and clamping. Use of locating and clamping principles in day-to-day supervision on shop floor. Degree of freedom-concept and importance. 3-2-1 principle of location. Locators, Fool proofing and ejecting. Clamping devices.	7
4	**Jigs and fixtures** Concept, meaning, differences and benefits of jigs and fixtures. Types, sketches with nomenclature, working and applications of jigs. Types, sketches with nomenclature, working and applications of fixtures. Steps to design jigs and fixture. For given simple component: Select type (Jig or fixture), Develop locating method, Develop clamping method. Design jig and fixture (as applicable). Prepare details and assembly sketches.	10

5	**Press tools** Press working processes, Press tools: types, working, components and their functions. Concept, meaning, definitions and calculations of press tonnage and shut height of press tool. Shear action in die cutting operation. Centre of pressure. Die clearance. Cutting force: Methods to calculate and methods of reducing. Shear angle- concept, need and method to give shear angle on punch and die. Scrap strip layout: - Concept, importance, method to prepare, and determining percentage stock utilization. Types, working, and applications of stock stop, pilots, strippers and knockouts. Cutting dies-types and applications. Design of progressive cutting die.	10
6	**Dies and moulds** Bending: Types. Parts and functions of bending die. Drawing dies-types and method to determine blank size for drawing operation. Types, sketch, working and applications of drawing dies (embossing, curling, bulging, coining, swaging and hole flanging). Forging dies types, sketch, working and applications. Sketch, working and applications of extrusion, plastic injection, blow moulding.	5
Practical content		
Practical, assignments and tutorials are based on above syllabus.		
Text Books		
1	Tool Engineering by S.V. Gosai, AtulPrakasan.	
Reference Books		
1	Fundamentals of tool design by ASTME, PHI.	
2	Tool design by Donaldson &Lecain, TME.	
3	Tool engineering by Doyal.	
4	Principles of tool & jig design by M. H. A. Kempster.	
5	Jigs and fixture by P. H. Joshi, TMGH publication.	